Azimuthal anisotropy of high p_t charged hadrons at RHIC

K. Filimonov, P. Jacobs, A. Poskanzer, R. Snellings and the STAR Collaboration

Hard processes are expected to play dominant role in particle production at large transverse momenta in high-energy heavy-ion collisions. The initial parton densities achieved at RHIC energies may be sufficient to cause fast partons to lose energy via multiple scattering and induced gluon radiation [1]. The energy loss is predicted to depend on the path length of the parton in the dense nuclear medium. An initial anisotropy in non-central nuclear collisions will result in an azimuthally asymmetric pattern of high p_t hadrons. The azimuthal anisotropy can be quantified by the second harmonic coefficient v_2 in the Fourier decomposition of the azimuthal distribution of particles with respect to the reaction plane.

The transverse momentum dependence of v_2 has been previously measured in Au+Au collisions at RHIC at $\sqrt{s_{NN}} = 130$GeV for charged and identified particles for relatively low p_t's [2]. Here we report the first results on $v_2(p_t)$ of charged particles measured in this reaction for transverse momenta up to 6.0 GeV/c. For this analysis, we have used an entire dataset from first year running of STAR experiment (203K minimum-bias and 315K centrally triggered events).

Fig. 1 shows v_2 as a function of p_t for three different collision centralities. At a given p_t, the more peripheral collisions have the larger value of v_2. For all centralities, v_2 rises almost linearly up to p_t=1.0 GeV/c, then starts to deviate from a linear rise in the region p_t=1.0-2.5 GeV/c, and finally, saturates for p_t >2.5 GeV/c.

Fig. 2 shows a comparison of minimum bias differential elliptic flow $v_2(p_t)$ with calculations. The hydro calculations [3] describe the data well up to p_t=1.0 GeV/c, but overpredict the elliptic flow at high p_t. The pQCD calculations predict the decrease of v_2 at high p_t [4].

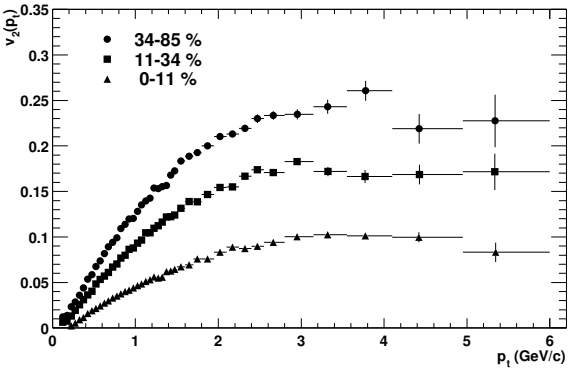

Figure 1: $v_2(p_t)$ for different collision centralities.

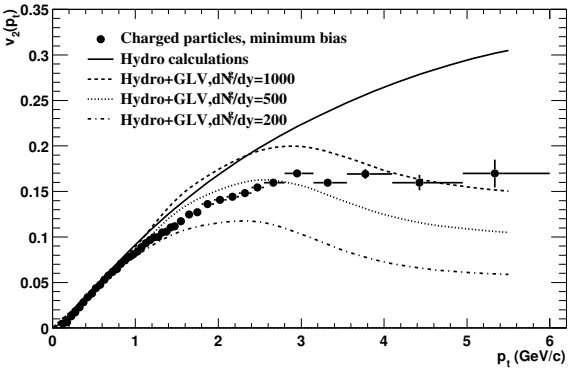

Figure 2: $v_2(p_t)$ for minimum bias events. The curves correspond to hydrodynamical [3] and pQCD calculations [4].

References

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